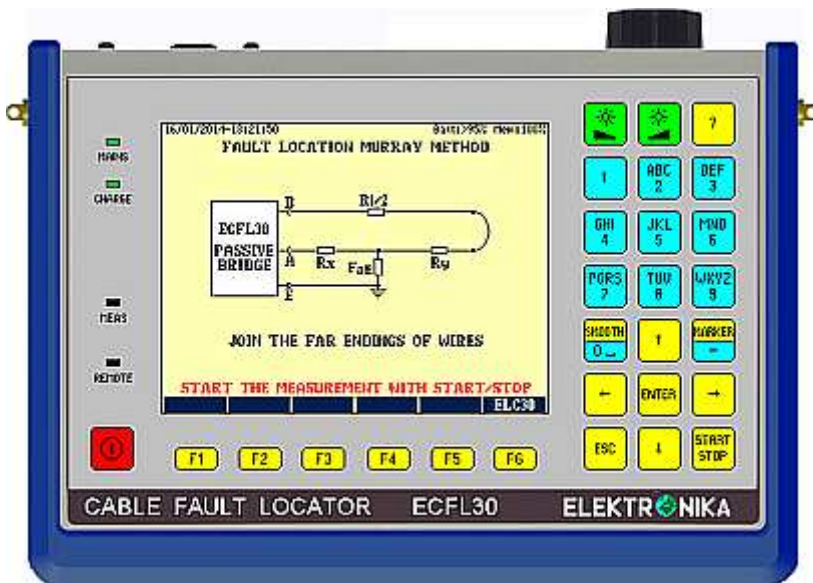


WHERE IS THE FAULT ? ECFL30 GIVES THE ANSWER !



FOUR INSTRUMENTS IN ONE

- **Active Bridge** for accurate location of faults where the level of disturbing voltages are low
- **Passive Wheatstone Bridge** for location of faults where the level of disturbing voltages are high
- **Graaf Fault Locator** for accurate fault location on totally water-soaked cable where the disturbing voltages are usually high and intermittent
- **TDR** to find low impedance faults and splits causing cross talk between the pairs. Manual and Automatic configuration provided

APPLICATIONS AND FEATURES

The **CABLE FAULT LOCATOR ECFL 30** hand-held instrument is intended to test the quality of telecom cables and to locate cable faults. That combined instrument provides several tools for the accurate location of DC/AC faults on the line:

Resistance Measurements

- Loop resistance
- Resistance difference
- Insulation resistance

Capacitance Measurements

- Cable capacitance
- Capacitive balance

DC Fault Location Methods

- Murray
- 3 Point
- K pfm ller
- Repeated K pfm ller

AC Fault Location Methods

- Interruption
- Repeated K pfm ller

Graaf Fault Location Method

- End to end Master-Slave measurement
- Fault location on totally water-soaked cable

TDR Measurements

- Single pair
- Double Pair Measurements
- XTALK
- Comparison to Memory

AC-DC Voltage measurements

Cable temperature measurement

Extremely Simple Operation

- Easy to use menu system
- Many-sided topic oriented help system
- Large Graphic Display with Backlight

Operation is made extremely comfortable by means of pre-defined automatic test sequences:

Automatic Test Sequences

- Cable State Survey to find the best test method
- Quick Test of main parameters
- Quality Test Sequence

USB Ports for Result Transfer

- USB B device-port for direct PC connection
- USB A host-port for USB stick (Indirect transfer)

The indirect transfer is advantageous for the user who does not have administrative right to install a special driver to his PC.

ECFL 30 is suitable for the remote control of loop closing devices on the far end. Utilizing that feature just one person can perform measurements during which the far endings of the tested pair should be opened or closed (e.g K pfm ller method).

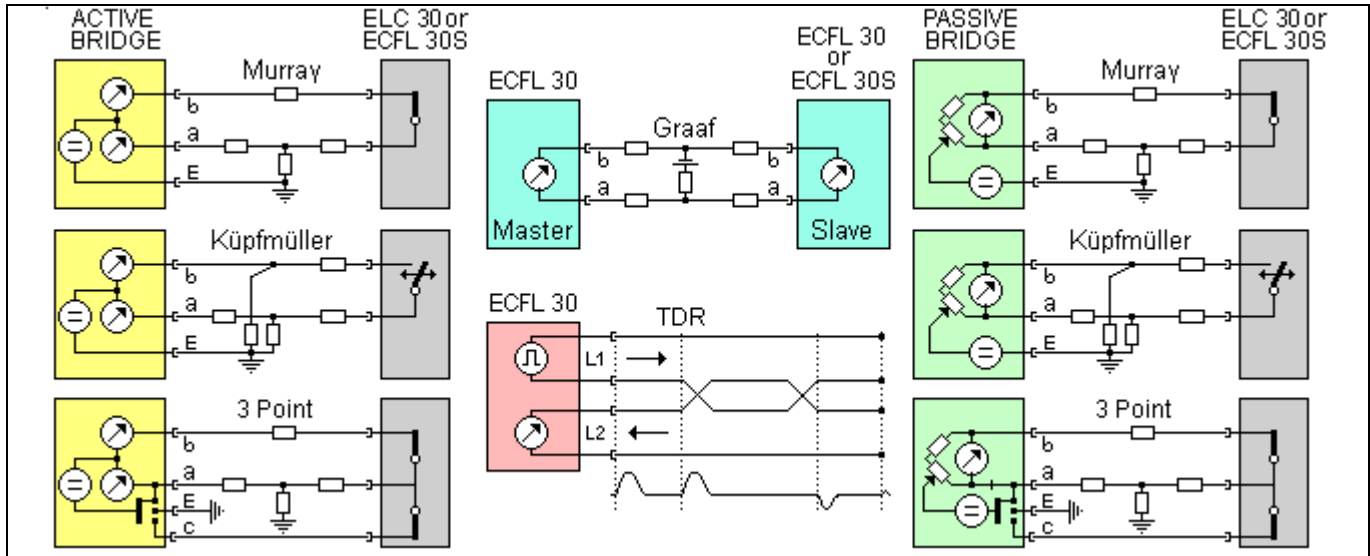
Remote Controllable Far end Devices

- ELC 30 loop closing device to open or close the far end of the tested cable
- ECFL 30S slave unit to perform synchronic end to end Graaf measurement and open or close the far end of the tested cable.

Single End Line Test (SW option)

- Loss and data transfer speed estimation

FAULT LOCATOR MODES



SPECIFICATIONS

TDR

Measuring Modes

Single Pair..... L1, L2, L1 long time, L2 long time
 L1 with automatic configuration
 Double Pair L1& L2, L1-L2, XTALK
 XTALK with automatic configuration
 Memory Modes L1& Memory, L1- Memory

Measuring Ranges

For non loaded cable (at V/2=100) up to 32 km
 For loaded cable (at V/2=10) 6.4 to 32 km
 The maximum range depends
 on cable type and condition

Evaluation of Results

With Cursor and Marker..... In meters
 Refreshing of waveform ~4/sec
 Zoom Maximum 16

Accuracy

Fault location 0.2% of range
 Resolution.....0.01 m

Propagation Velocity

For non loaded cables

V/2..... 45 to 149 m/μs
 VOP30 to 99 %

For loaded cables

V/2..... 1.2 to 30 m/μs
 VOP0.8 to 20 %

Pulse Characteristics

Widths for non loaded cable 4 ns to 6 μs
 Widths for loaded cable 330 μs
 Amplitude:..... 1.3 to 12 Vpp into 120 Ω
 Automatically changed
 with gain and width.

Line Connection

Impedance 120 Ω balanced
 Balance control 50 to 270 Ω

Gain Control

Range0 to 90 dB
 Steps..... 6 dB/Step

Distance Dependent Amplitude Correction

Number of steps 10

ACTIVE BRIDGE

Voltage

DC voltage..... up to 400 V
 AC voltage..... up to 250 V eff
 Accuracy.....±3% ±1 V
 Frequency range 15 to 300 Hz
 Input resistance2 M Ω

Loop Resistance

Measuring range 1 Ω to 10 kΩ
 Accuracy.....±0.3% ±0.1 Ω

Resistance Difference

Loop resistance range..... 10 Ω to 5000 Ω
 Accuracy.....±0.2% of RI ±0.2 Ω

Insulation Resistance

Measuring range 10 kΩ to 300 MΩ
 Measuring voltage 100 V
 Accuracy.....2 to 5% ±1 kΩ

Capacitance

Measuring range 1 nF to 2 (10) μF
 Measuring voltage 11 Hz, 100 V
 Accuracy.....±2% ±0.2 nF

Capacitive Balance

Measuring range 1 nF to 2000 nF
 Measuring voltage 11 Hz, 100 V
 Accuracy of Lx/L value ±0.2 %

DC Fault Location

Test Methods..... Murray, Küpfmüller, 3 Point
 Loop resistance range..... 1 Ω to 10 kΩ
 Fault resistance range..... up to 100 MΩ
 Measuring voltage 100 V
 Accuracy (RI=2 kΩ, Lx/L=0,1 to 1)
 Fault resistance < 1MΩ ± 0.2 %
 Fault resistance 1 MΩ to 5 MΩ ± 0.3 %
 Fault resistance 5 MΩ to 25 MΩ ± 0.5 %
 Fault resistance 25 MΩ to 100 MΩ ± 2 %

AC Fault Location Interruption

Range up to 20 km (Depends on cable typ)
 Accuracy ±2% ±0.2 nF

PASSIVE BRIDGE

Loop Resistance

Measuring range.....1 Ω to 10 kΩ
 Accuracy.....±0.3% ±0.3 Ω

Insulation Resistance

Measuring modesQuick measurement,
 Quality measurement

Measuring ranges

Quick measurement10 kΩ to 300 MΩ

Quality measurementup to 10 GΩ

Measuring voltage100 V
 Accuracy

10 kΩ to 50 MΩ5 % ± 1 kΩ

50 MΩ to 100 MΩ10 %

100 MΩ to 5 000 MΩ20 %

5 000 MΩ to 10 000 MΩ30 %

Resistance Difference

Loop resistance range1 Ω to 5000 Ω

Accuracy±0.2% of RI ±0.2 Ω

Resolution of Lx/L (Mk)-value

In range ΔR <10%.....1/10000

In range ΔR >10%.....1/1000

DC Fault Location

Test methodsMurray, Küpfmüller, 3 Point

Loop resistance range1 Ω to 10 kΩ

Fault resistance rangeup to 100 MΩ

Measuring voltage100 V

Accuracy (RI=2 kΩ, Lx/L=0,1 to 1)

Fault resistance < 1 MΩ0.2 %

Fault resistance 1 MΩ to 5 MΩ0.3 %

Fault resistance 5 MΩ to 25 MΩ0.5 %

Fault resistance 25 MΩ to 100 MΩ2 %

Resolution of Lx/L (Mk) value1/1000

AC Fault Location Küpfmüller Method

Loop resistance range1 Ω to 10 kΩ

Fault resistance rangeup to 25 MΩ

Measuring voltage11 Hz, 100 V

Accuracy (RI=2 kΩ, Lx/L=0,1 to 1)

Fault resistance < 1 MΩ±0.3%

Fault resistance 1 MΩ to 5 MΩ±0.5%

Fault resistance 5 MΩ to 25 MΩ±1.0%

Resolution of M value1/1000

AC Capacitive Balance

Measuring range.....10 nF to 2000 nF

Accuracy of Lx/L value±0.2%

Measuring voltage11 Hz, 100 V

Resolution of Lx/L value

In range Lx/L=0.9 to 1.11/10000

In range Lx/L<0.9 or Lx/L>1.11/1000

Fault Location Graaf Method

Loop resistance range10 Ω to 10 kΩ

DC current range.....10μA to 1A

Accuracy of current measurement.....±0.3% ±2μA

Accuracy of Lx/L value (current >0.1mA)±3%

Accuracy of Lx/L value (current >1mA) ±0.3%

PRE MEASUREMENTS

Repeated Disturbing Voltage Measurement

Measuring range

DC voltage.....up to 400 V

AC voltage.....up to 250 V eff

Frequency range15 to 300 Hz

Repeated Loop Resistance Measurement

Measuring range1 Ω to 10 kΩ

Accuracy±0.5 % ±0.2 Ω

Repeated Insulation Resistance Measurements

Measuring modeRepeated measurement

Measuring range.....10 kΩ to 300 MΩ

Measuring time~ 3 sec

Measuring voltage100 V

Repeated DC Current Measurement

Measuring range.....5μA to 0.1A

Accuracy±0.5 % ±1 μA

Temperature (with Pt 1000 temperature probe)

Temperature range.....-20 to +60°C

Resolution0.1°C

Accuracy.....±0.4°C

AUTOMATIC QUICK TEST

Disturbing Voltage

Measuring range.....up to 400 V DC, 250 V AC

Test resultsVab, VaE and VbE

Insulation

Measuring range10 kΩ to 300 MΩ

Measuring time~3 x 20 sec

Capacitance

Measuring range10 to 2000 nF

Capacitive Balance

Test resultUnbalance %

Measuring voltage11 Hz, 100 V

AUTOMATIC QUALITY TEST

Insulation

Measuring range10 kΩ to 10 000 MΩ

Measuring time~3 x 35 sec

Capacitance

Measuring range10 to 2000 nF

Capacitive Balance

Test resultUnbalance %

Resolution1/1000

Loop Resistance

Measuring range1 Ω to 10kΩ

Accuracy±0.3% ±0.1 Ω

Resistance Difference

Loop resistance range10 Ω to 5 kΩ

Resolution1/1000

SURVAY OF PAIR CONDITION

The purpose of this measurement is to find the optimal fault location method. Measured parameters:

- Disturbing voltage
- Capacitance
- Loop and wire resistances
- Insulation resistances

GENERAL SPECIFICATIONS

Power Supply

Internal rechargeable NiMH battery pack
 Operation timeapprox. 8 hours
 (Without backlight)
 Charging (without taking the battery pack out)
 From 100 to 240 V mains with mains adapter
 From 12 V car battery with car adapter
 Charging time less than 3 hours
 (Fast charging mode)
 Display 320 x 240 color LCD TFT
 with backlight

Connectors

Connector for mains adapter 2.1/5.5mm coax
 L1 and L2 line
 connectors 4 mm banana sockets
 Ground connector 4 mm banana socket
 USB A USB 1.1 host port for USB-Stick
 (FAT16, FAT32 file system supported)
 USB B USB 1.1 device port to connect PC
 (Device driver provided)

Over Voltage Protection

Between a and b
 or ground 500 V DC, 350 V AC
 Longitudinal voltage..... 60 V AC

Ambient temperature ranges

Reference23±5°C
 Rel. humidity 45% to 75%*
 Normal operation 0 to +40°C
 Rel. humidity 30% to 75% *(<25g/m³)
 Limits of operation..... -5 to +45°C
 Rel. humidity 5% to 95% *(< 29 g/m³)
 Storage and transport -40 to +70°C
 Rel. humidity 95% at +45°C *(<35g/m³)
 Protection..... IP 54

Memory Locations

For test results50
 For cable parameter.....50

Mechanical Data

Dimensions224 x 160 x 75 mm
 Weight (Including battery pack) ca. 1.8 kg

* Without condensation

ORDERING INFORMATIONS

CABLE FAULT LOCATOR

ECFL 30..... 419-000-000

Including:

Operating manual
 Short form operation instruction
 Calibration Certificate
 CD
 Ground cable
 2-wire test lead (red/black)
 2- wire test lead (blue/yellow)
 Mains adapter 100 to 264 VAC
 USB cable
 USB stick
 Battery pack (built-in)
 Carrying case

HW Options

Loop closing device ELC 30..... 421-000-000
 Intelligent Slave ECFL 30S 425-000-000
 Coaxial adapter ECA 10..... 378-000-000
 Car battery adapter EAA 10 Y 367-000
 Temperature probe PT 1000.....Y-146-014

SW Options

Result transfer PC SW SW 419-510-000
 Multi section Cable SW SW 419-520-000
 Loaded Cable SW SW 419-530-000
 Single End Line Test SW SW 419-540-000

Others

Calibration Report CR419-000-000E